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A Low-Cost Disposable Microfluidic Biochip for malaria diagnosis

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Malaria is one of the leading life threatening infectious disease in underdeveloped and developing countries. According to the latest report (2016) from world health organization (WHO), there were 212 million cases of malaria and an estimated 429, 000 malaria deaths. Malaria is caused by protozoan of the genus Plasmodium spread by female Anopheles species mosquitoes. Among these, Plasmodium falciparum (P. falciparum) is the most severe form of malaria and interest is focused on the detection of Plasmodium-specific proteins. One of these, falciparum histidinerich protein II (HRP II) based assays shows the better sensitivity and specificity compared to those of other proteins for the detection of P. falciparum. At present, there are several clinical methods to diagnosis malaria by detecting histidinerich protein II. However, these techniques are time consuming, expensive, and require a trained technician. In the view of the above, the development of a simple, cheap, and fully integrated point-of-care biochip is extremely required for early detection of malarial parasites and prevention of malarial epidemic. Here, we present the realization of a portable, flexible, and low cost biochip for quantitative malaria diagnostic testing at the point-of-care. The biochip incorporates a sensing platform integrated with a three-electrode system and microfluidics fabricated via low cost printing and tune transfer method. The sensing electrode consists of malarial specific antibody conjugated nanofibers. Upon recognizing the presence of even a trace of malaria's biomarkers in blood serum, the device registered a signal. It will be useful in rural areas where diagnostic facilities are not available readily. This fully integrated biochip offers a promising cost-effective approach for detection of several other infectious disease biomarkers for point-of- care diagnostics.